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(54) **FLUID DISPENSING SYSTEM FOR A WASHING DEVICE**

(75) Inventors: **Jerrod Aaron Kappler**, Louisville, KY (US); **Joseph Duane Tobbe**, Taylorsville, KY (US); **Paul Douglas Mantle**, Dublin, OH (US); **Shelly Elizabeth Warms**, Louisville, KY (US)

(73) Assignee: **General Electric Company**, Schenectady, NY (US)

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B08B 3/02 (2006.01)

(52) **U.S. Cl.** ..... **134/58 D**; 134/56 D; 134/57 D; 134/94.1; 134/99.2

(58) **Field of Classification Search** ..... 134/56 D, 134/57 D, 94.1, 99.2
See application file for complete search history.

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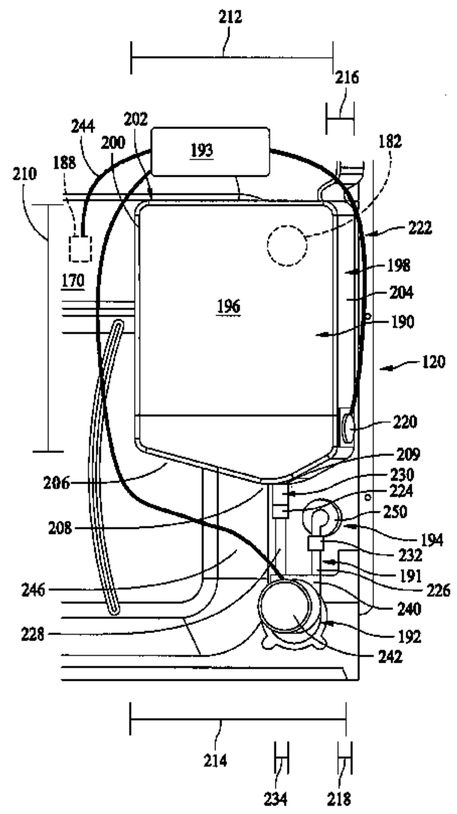
Primary Examiner—Michael Barr
Assistant Examiner—Saeed T Chaudhry
(74) *Attorney, Agent, or Firm*—George L. Rideout, Esq.; Armstrong Teasdale LLP

(57) **ABSTRACT**

A fluid dispensing system for a dishwasher door assembly having an inner door panel and an outer door panel is provided. The fluid dispensing system includes a storage tank fixedly coupled within the door assembly between the inner door panel and the outer door panel. A pump is fixedly coupled within the door assembly. A dispenser extends at least partially through the door assembly. At least one conduit is in flow communication with the storage tank, the pump, and the dispenser. A control board is in electrical communication with the pump.

13 Claims, 4 Drawing Sheets



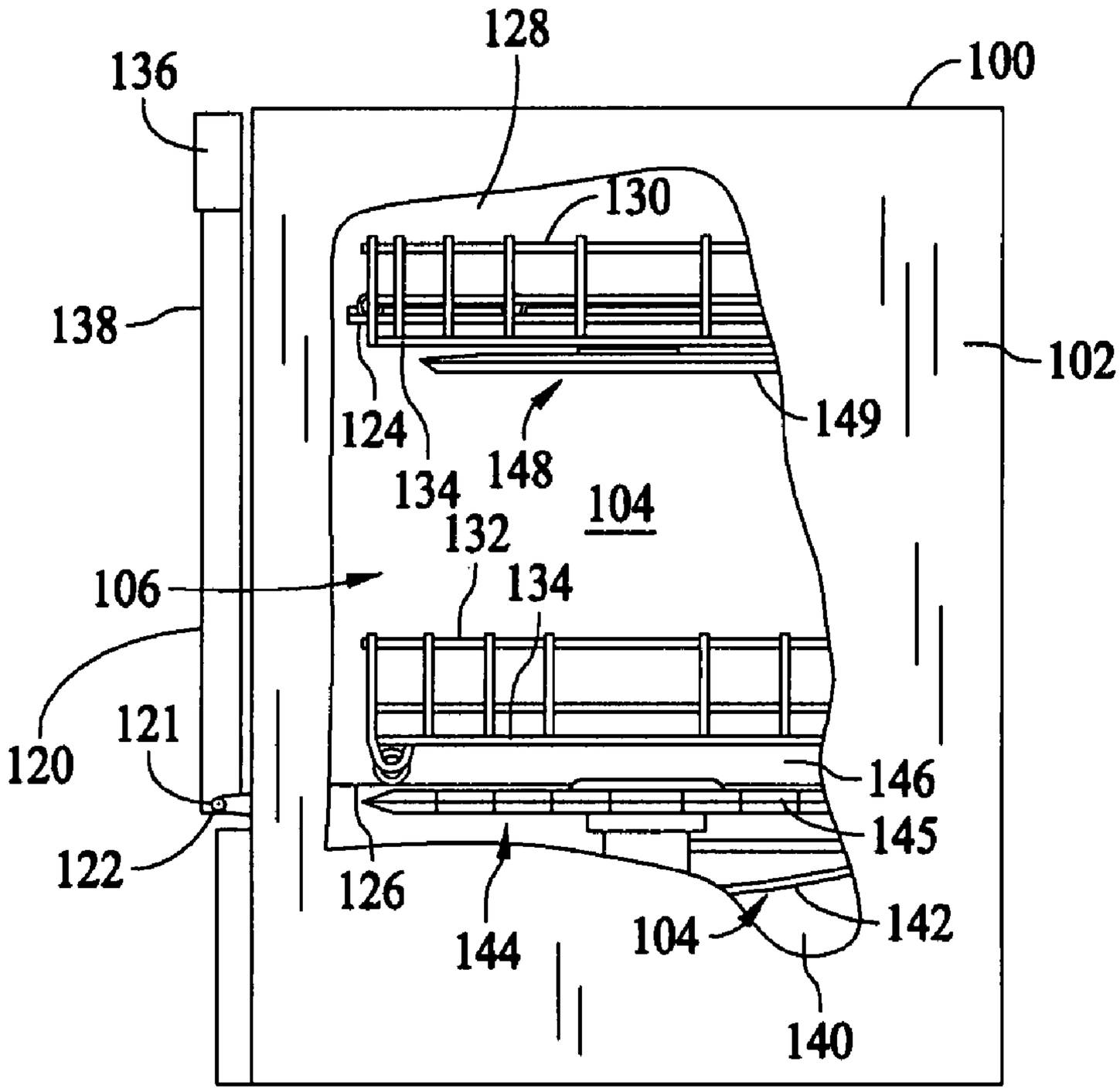

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FIG. 1

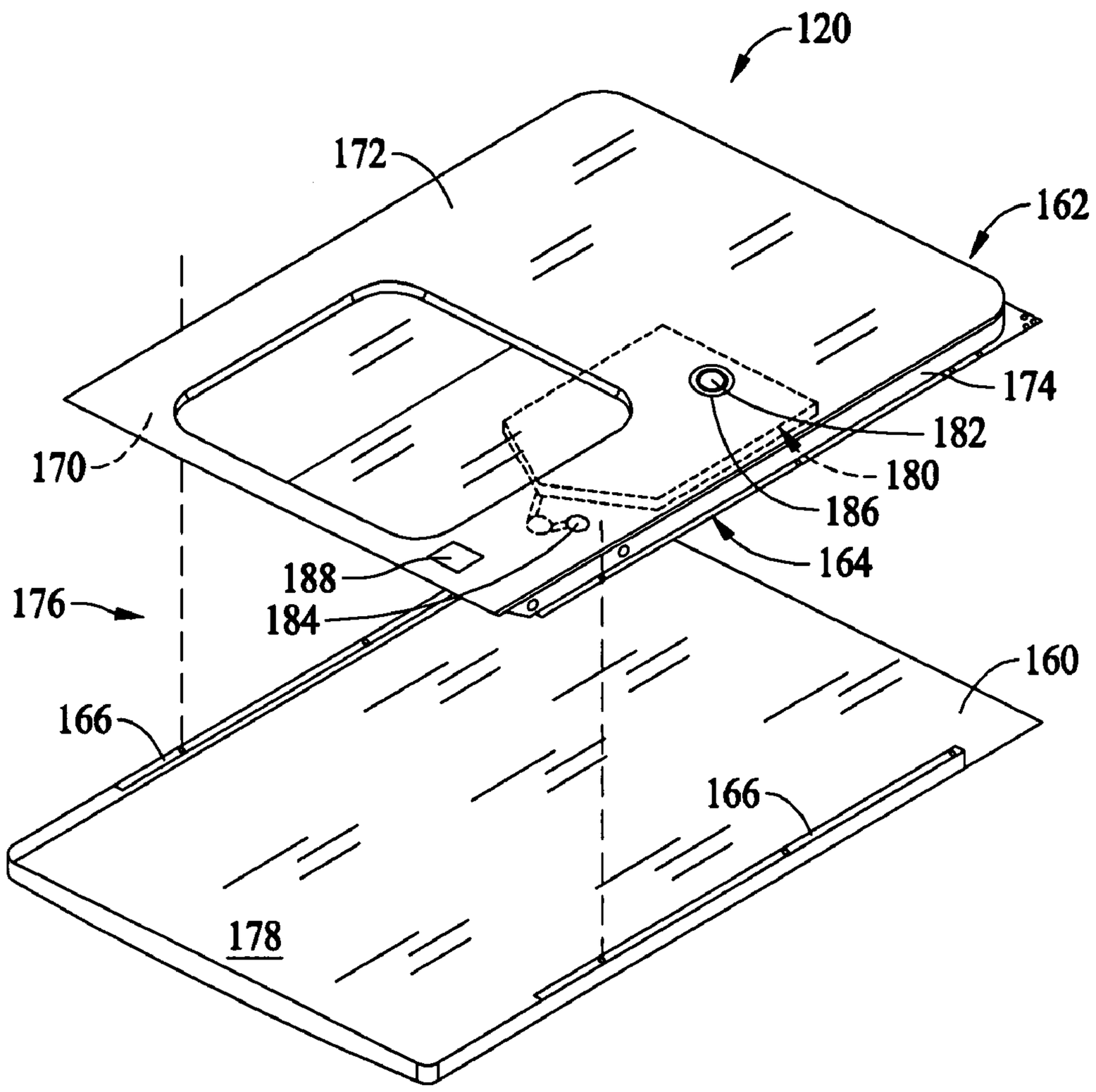

FIG. 2

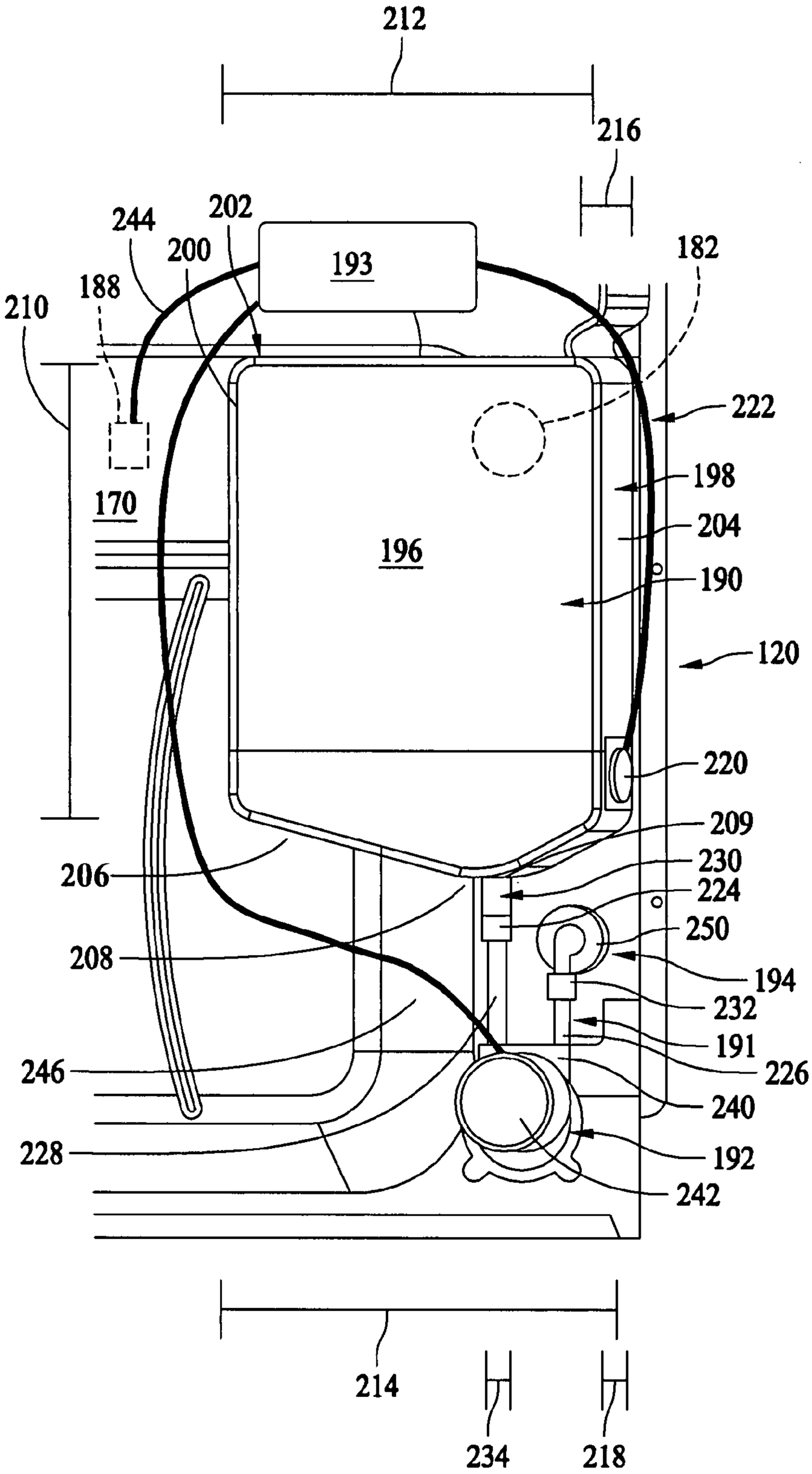
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FIG. 3

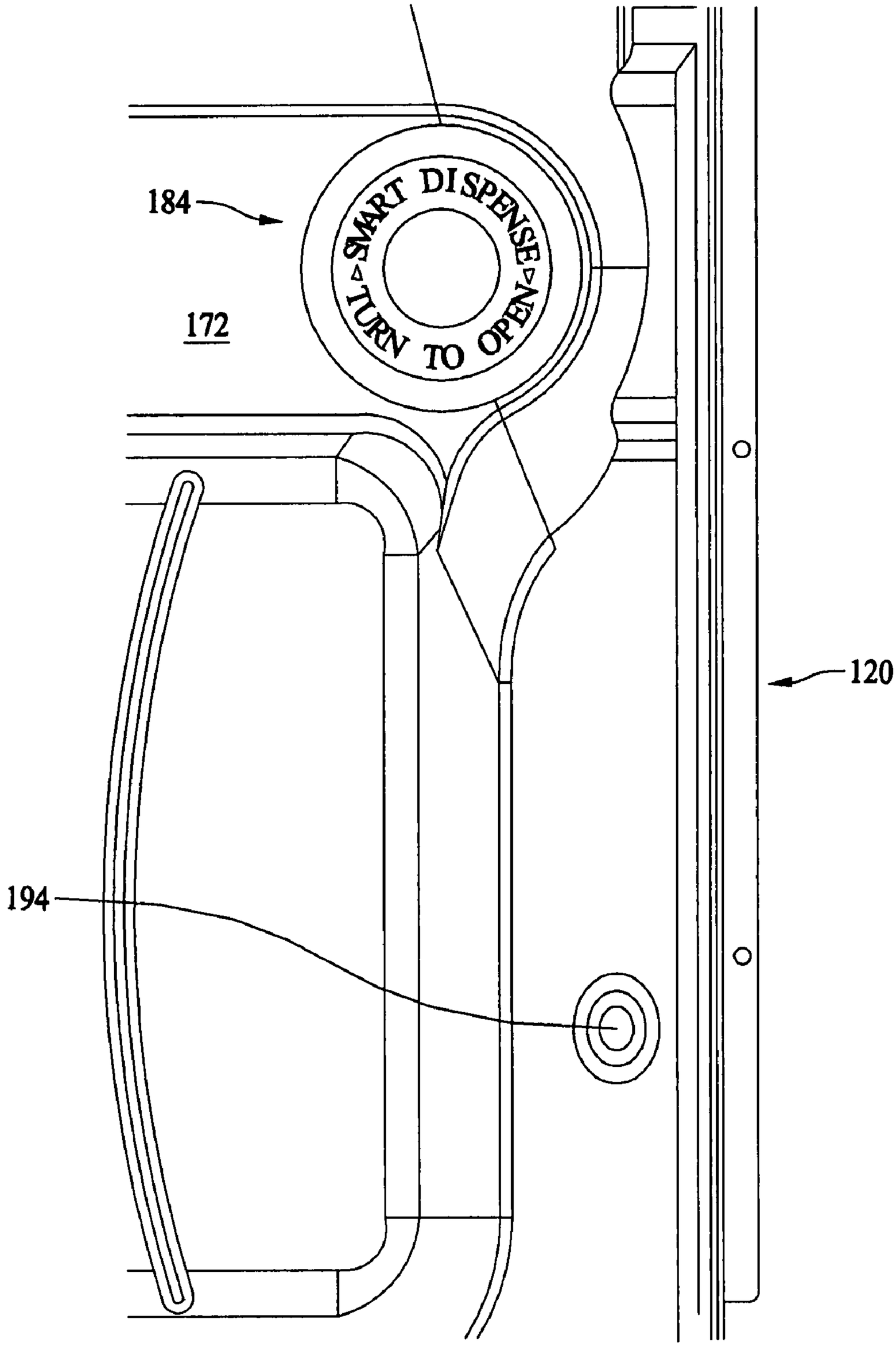

FIG. 4

FLUID DISPENSING SYSTEM FOR A WASHING DEVICE

BACKGROUND OF THE INVENTION

This invention relates generally to dishwashers, and more particularly, to detergent dispensers for dishwashers.

At least some known dishwashers include a cabinet, a tub within the cabinet that defines an open sided wash chamber, and a door assembly that seals the open side of the wash chamber when the dishwasher is in use. Soiled dishes, glasses, utensils, food and beverage containers, etc. are loaded into the dishwasher tub through the open side of the wash chamber when the door is open, and after the door is closed, a dishwasher cycle is executed to clean the items placed therein. The wash chamber includes a sump portion that pumps washing fluid from a fluid circulation assembly through spray arm conduits to wash items loaded onto dishwasher racks in the wash chamber, and also collects wash fluid after it has circulated throughout the wash chamber. The door assembly is attached to the dishwasher at a bottom end of the door and pivots about a hinge between fully open and fully closed positions.

Some known dishwashers include a detergent dispenser attached to an inner portion of the door assembly. The detergent dispenser includes a trough and a hinged lid or cover that closes the trough and prevents solid or powdered detergent therein from contacting moisture until a designated time in a wash cycle. At a point in time, the cover is opened and the detergent in the reservoir is released. To facilitate removal of all of the detergent from the dispenser, or to more quickly release detergent from the dispenser, a water spray jet may be directed into the trough to clear detergent from the dispenser trough. However, the detergent dispenser is refilled between each dishwasher use by an operator, thereby adding additional steps and time. In addition, consistently and accurately filling the dispenser trough according to the selected wash cycle can be challenging. If too little detergent is added, wash cycle efficiency and effectiveness is decreased. If too much detergent is added, the additional detergent may be wasted or increase the risk of etching or spots.

Additionally, some known dishwashers include a detergent tank removeably attached to the door assembly. The detergent tank is coupled to a detergent dispenser that includes a trough and a hinged lid or cover that closes the trough and prevents the detergent therein from contacting moisture until a designated time in a wash cycle. At a point in time, the cover is opened and the detergent in the reservoir is released. However, the detergent tank must be removed in order to refill, thereby adding additional steps and time. In addition, consistently and accurately dispensing the correct amount of detergent based on the state of the dishes, hardness of the water, and water temperature may be challenging. The correct amount of detergent has a direct effect on the wash cycle efficiency and effectiveness.

BRIEF DESCRIPTION OF THE INVENTION

In one aspect, a method of dispensing a fluid into a washing device including a wash chamber is provided. The method includes positioning a fluid dispensing system within a door assembly including an outer wall, an inner wall, and a cavity defined therebetween. The inner wall includes an outer surface and an inner surface, wherein the fluid dispensing system is fixedly coupled to the inner wall and/or the outer wall. The method further includes determining an amount of fluid to dispense and pumping the determined amount of fluid within the wash chamber.

In another aspect, a fluid dispensing system for a dishwasher door assembly is provided. The system includes at least one storage tank fixedly coupled within the door assembly, at least one pump fixedly coupled within the door assembly, and at least one dispenser extending at least partially through the door assembly. The system also includes at least one conduit in flow communication with the tank, the pump, and the dispenser and a control board in electrical communication the storage tank and the pump.

In another aspect, a dishwasher is provided. The dishwasher includes a cabinet that includes a tub having a front opening and a door assembly forming a wash chamber. The door assembly includes an outer door panel, an inner door panel, and a plurality of sidewalls extending therebetween. The dishwasher includes at least one fluid dispensing system in flow communication with the wash chamber. The system includes at least one storage tank fixedly coupled within the door assembly, at least one peristaltic pump fixedly coupled within the door assembly, at least one dispenser extending at least partially through the inner door panel. The system also includes at least one flexible conduit removeably coupled to the door assembly and in flow communication with the tank, the pump, and the dispenser, and a control board in electrical communication the storage tank and the pump.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of an exemplary dishwasher partially broken away.

FIG. **2** is a perspective exploded view of a dishwasher door assembly including a fluid dispensing system for the dishwasher shown in FIG. **1**.

FIG. **3** is a top perspective view of the fluid dispensing system shown in FIG. **2**.

FIG. **4** is a rear perspective view of the fluid dispensing system shown in FIG. **2**.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a side elevational view of an exemplary domestic dishwasher system **100** partially broken away. It is contemplated, however, that the methods and apparatus herein described may be practiced in other types of dishwashers and dishwasher systems beyond dishwasher system **100** described and illustrated herein. Moreover, the methods and apparatus herein described may find utility in other applications wherein dispensers in wet environments are desirable. Accordingly, the following description is for illustrative purposes only, and the methods and apparatus herein described is in no way limited to use in a particular application, or to a particular type of appliance, such as, for example, dishwasher system **100**.

Dishwasher **100** includes a cabinet **102** having a tub **104** therein and forming a wash chamber **106**. Tub **104** includes a front opening (not shown in FIG. **1**) and a door assembly **120** pivotally attached by a hinge **121** at a bottom **122** for movement between a normally closed vertical position (shown in FIG. **1**) wherein wash chamber **106** is sealed shut for washing operation, and a horizontal open position (not shown) for loading and unloading of dishwasher contents. An upper guide rail **124** and a lower guide rail **126** are mounted on tub side walls **128** and accommodate an upper roller-equipped rack **130** and a lower roller-equipped rack **132**. Each of upper and lower racks **130**, **132** is fabricated from known materials

into lattice structures including a plurality of elongate members **134**, and each rack **130**, **132** is adapted for movement between an extended loading position (not shown) in which the rack is substantially positioned outside wash chamber **106**, and a retracted position (shown in FIG. **1**) in which the rack is located inside wash chamber **106**. A silverware basket (not shown) is removably attached to lower rack **132** for placement of silverware, utensils, and the like that are too small to be accommodated by upper and lower racks **130**, **132**.

A control panel (not shown in FIG. **1**) is integrated into an escutcheon **136** that is mounted to door assembly **120**, or in further and/or alternative embodiments, a plurality of control selectors, (e.g., buttons, switches or knobs) or control displays etc. may be mounted at a convenient location on an outer face **138** of door assembly **120**. The control panel and associated selectors and displays are coupled to known control circuitry (not shown) and control mechanisms (not shown) for operating a fluid circulation assembly (not shown) that circulates water and dishwasher fluid in dishwasher tub **104**. The fluid circulation assembly is located in a machinery compartment **140** located below a bottom sump portion **142** of tub **104**. The construction and operation of the fluid circulation assembly is well within the purview of those in the art without detailed explanation, and further discussion of the fluid circulation assembly is therefore omitted.

A lower spray-arm-assembly **144** is rotatably mounted within a lower region **146** of wash chamber **106** and above tub sump portion **142** so as to rotate in relatively close proximity to lower rack **132**. A mid-level spray-arm assembly **148** is located in an upper region of wash chamber **106** and is located in close proximity to upper rack **130** and at a sufficient height above lower rack **132** to accommodate a larger item, such as a dish or platter (not shown), that can be placed in lower rack **132** and washed in dishwasher system **100**. In another embodiment, an upper spray arm assembly (not shown) is located above upper rack **130** at a sufficient height to accommodate a taller item that can be placed in upper rack **130**, such as a glass (not shown) of a selected height.

Lower and mid-level spray-arm assemblies **144**, **148** and the upper spray arm assembly are fed by the fluid circulation assembly, and each spray-arm assembly includes an arrangement of discharge ports or orifices **145**, **149**, respectively, for directing washing liquid onto dishes located in upper and lower racks **130**, **132**, respectively. The arrangement of discharge ports **145** in at least lower spray-arm assembly **144** provides a rotational force by virtue of washing fluid flowing through discharge ports **145**. The resultant rotation of lower spray-arm assembly **144** provides coverage of dishes and other dishwasher contents with a washing spray. In various alternative embodiments, mid-level spray arm **148** and/or the upper spray arm are also rotatably mounted and configured to generate a swirling spray pattern above and below upper rack **130** when the fluid circulation assembly is activated and door assembly **120** is properly closed to seal wash chamber **106** for operation.

FIG. **2** is an exploded perspective view of dishwasher door assembly **120**. Door assembly **120** may be used, for example, with dishwasher **100** (shown in FIG. **1**). In the exemplary embodiment, door assembly **120** includes an outer door panel **160** and an inner door panel **162**. It is noted that exemplary inner door panel **162** and outer door panel **160** are intended for illustrative purposes only, and that the herein described invention may be used with differently configured inner and/or outer door panels than illustrated, as well as a plurality of intermediate door panels (not shown) positioned between outer door panel **160** and inner door panel **162**.

In the exemplary embodiment, inner door panel **162** is attached to outer door panel **160** via a plurality of attachment flanges **164** on an outer perimeter of inner door panel **162** that are fastened to a plurality of attachment flanges **166** in outer door panel **160**. In the exemplary embodiment, inner door panel **162** includes an inner surface **170**, an outer surface **172**, a plurality of sidewalls **174** extending therebetween, and a cavity **176** defined therein. Cavity **176** may have a variety of shapes and sizes to facilitate permanently positioning a fluid dispensing system **180** therein and adjacent inner surface **170**.

It is contemplated that fluid dispensing system **180**, as explained further below, is permanently located within door assembly **120**. In the exemplary embodiment, system **180** is permanently attached to inner surface **170**. In an alternative embodiment, system **180** is attached to an inner surface **178** of outer door panel **160**.

In the exemplary embodiment, fluid dispensing system **180** is a detergent dispensing system configured to dispense commercially available dishwashing detergent. In one embodiment, system **180** dispenses a rinse agent. In alternative embodiments, system **180** is configured to dispense any other suitable fluid that enables system **180** to function as described herein.

Door panel **162** includes a refill inlet **182** and a detergent outlet **184** both extending at least partially through door panel **162** and in flow communication with system **180**. Inlet **182** facilitates the addition of detergent to system **180** and outlet **184** facilitates the delivery of detergent to the wash chamber. In the exemplary embodiment, inlet **182** and outlet **184** may be fabricated by a molding process. Alternatively, inlet **182** and outlet **184** may be fabricated by other processes, such as, but not limited to, a forming process, a milling process, or a grinding process. In the exemplary embodiment, a sealing cap **186** is non-removeably coupled to inlet **182**. In an alternative embodiment, cap **186** is removable. In one embodiment, an appliance control module (not shown) and a latch assembly (not shown) are positioned within door assembly **120** as those in the art will appreciate.

In the exemplary embodiment, door panel **162** further includes a sensor **188** extending outwardly from outer surface **172**. In the exemplary embodiment, sensor **188** is at least one of a temperature sensor, thermostat, a turbidity sensor, and a hardness sensor. Alternatively, sensor **188** includes three separate sensors selected from the group of sensors, such as, but not limited to, sensors configured to determine the soil level of the dishes, the temperature of the water, and the hardness of the water.

FIG. **3** is a top perspective view of fluid dispensing system **180**. FIG. **4** is back perspective view of fluid dispensing system **180**. In the exemplary embodiment, fluid dispensing system **180** includes a reservoir or a storage tank **190**, a conduit **191**, a pump **192**, a control board **193**, and a dispenser **194** all in flow communication with one another. In the exemplary embodiment, tank **190** is pentagonal in shape. In alternative embodiments, tank **190** has other shapes, such as but not limited to, a triangular shape, and a curvilinear shape. In the exemplary embodiment, tank **190** is unitary and fabricated from a molded polyethylene material. In alternative embodiments, tank **190** is fabricated from any other suitable material that enables tank **190** to function as described herein, such as a clear material. In the exemplary embodiment, tank **190** is fabricated by a molding process. Alternatively, tank **190** is fabricated by other processes, such as, but not limited to, a forming process, a milling process, or a grinding process. In alternative embodiments, a plurality of tanks **190** are included, such as, a detergent tank and a rinse agent tank (not shown).

In the exemplary embodiment, tank **190** includes a top surface **196**, a bottom surface (not shown), and a plurality of sidewalls **198** extending therebetween. Specifically, in the exemplary embodiment, tank **190** includes a first sidewall **200**, a second sidewall **202**, a third sidewall **204**, and a fourth sidewall **206**. First and third sidewalls **200** and **204** are substantially parallel to one another and second and fourth sidewalls **202** and **206** are substantially not parallel to one another. As such, first and third sidewalls **200** and **204** are perpendicular to second sidewall **202**.

Fourth sidewall **206** includes an arcuate portion **208** positioned therebetween. In the exemplary embodiment, arcuate portion **208** is positioned proximate third sidewall **204**. In another embodiment, arcuate portion **208** is positioned proximate second sidewall **202**. In the exemplary embodiment, arcuate portion **208** includes an outlet **209** extending therethrough and is in flow communication with conduit **191**. In the exemplary embodiment, outlet **209** is fabricated by a molding process. Alternatively, outlet **209** is fabricated by other processes, such as, but not limited to, a forming process, a milling process, or a grinding process.

First and third sidewalls **200** and **204** have a first length **210**, second sidewall **202** has a second length **212**, and fourth sidewall **206** has a third length **214**. In the exemplary embodiment, lengths **210**, **212**, and **214** are all different. Specifically, in the exemplary embodiment, lengths **212** and **214** are less than length **210** and length **212** is less than length **214**. Alternatively, lengths **210**, **212**, and **214** may be selected to be any length. Additionally, sidewall **202** has a first height **216** and fourth sidewall **206** has a second height **218**. In the exemplary embodiment, heights **216** and **218** are different. Specifically, height **216** is greater than height **218**. As such, first and third sidewalls generally taper towards fourth sidewall **206**. In alternative embodiments, lengths **210**, **212**, and **214** and/or height **216** may be longer or shorter than the above indicated lengths and heights, depending upon the particular application.

In the exemplary embodiment, the tank bottom surface is fixedly coupled to inner door panel inner surface **170** such that tank **190** is permanently attached to inner surface **170**. In an alternative embodiment, tank **190** is permanently attached to an intermediate structure (not shown) within door assembly **120**. In the exemplary embodiment, tank **190** is fixedly coupled to inner surface **170** by a plurality of fasteners. Alternatively, tank **190** is fixedly coupled to inner surface **170** by a plurality of mechanical fasteners, such as, but not limited to, snap-fit fasteners or other known locking or latching fasteners, or chemical fasteners, such as an adhesive. Alternatively, tank **190** is molded within door assembly **120**.

In the exemplary embodiment, tank sidewall **204** includes a fluid sensor **220** extending therein and in electrical communication with control board **193**. In the exemplary embodiment, sensor **220** is coupled to third sidewall **204** adjacent fourth sidewall **206**. In alternative embodiments, sensor **220** is positioned anywhere on or in tank **190**. In the exemplary embodiment, sensor **220** is configured to determine whether fluid is present in tank **190** and generate a signal to control board **193** along a wire **222**. In an alternative embodiment, sensor **220** is a stand alone sensor not in electrical communication with control board **193**. In alternative embodiments, sensor **220** may be any sensor configured to detect the presence or non-presence of fluid.

In the exemplary embodiment, tank conduit **191** is flexible and cylindrical in shape. In one embodiment, conduit **191** is a one-piece tube or hose fabricated from a molded polymer material. In alternative embodiments, conduit **191** is fabricated from any other suitable elastic or rubber material, such as silicone rubber or Autoprene® (commercially available from Monsanto Corporation, St. Louis, Mo.) that enables conduit **191** to function as described herein. In alternative embodiments, conduit **191** is fabricated from a combination of flexible and/or rigid materials.

In the exemplary embodiment, conduit **191** includes a first end **224**, a second end **226**, and a body **228** extending therebetween. Additionally, conduit **191** includes a first connector **230** operatively coupled to outlet **209** and a second connector **232** operatively coupled to dispenser **194**. As such, at least a portion of body **228** extends within pump **192**. In the exemplary embodiment, connectors **230** and **232** are removeably coupled to tank outlet **209** and dispenser **194**, respectively. In an alternative embodiment, tank **190**, conduit **191**, and dispenser **194** are one-piece. As such, conduit **191** is non-removable from tank outlet **209** and dispenser **194**.

Conduit **191** has a length (not shown) and a diameter **234**, wherein tube diameter **234** is equal to a tank outlet diameter (not shown) and a dispenser diameter (not shown). The length and diameter **234** are variably sized and the number of conduits chosen is relative to the location and number of tanks **190** and dispensers **194** within door assembly **120** and the size of system **180**.

In the exemplary embodiment, pump **192** is a single peristaltic pump fixedly coupled within door assembly **120** and is in electrical communication with control board **193** and in mechanical communication with tank **190**, conduit **191**, and dispenser **194**. Alternatively, a plurality of pumps **192** are fixedly coupled within door assembly to each of tank **190** and a rinse agent tank (not shown). Pump **192** is configured to facilitate pumping an optimal amount of fluid into wash chamber **106** (shown in FIG. **1**) during one or more wet portions of the wash cycle based on at least one of a water temperature, a water hardness, and a soil level as determined by sensor **188** described above. The wet portion of the wash cycle includes a plurality of fills, wherein each fill includes activation of the water valve, circulation of the wash fluid, and draining of the wash chamber. In the exemplary embodiment, the wash cycle includes a pre-wash and a main wash. It is noted that the exemplary pre-wash cycle and main wash cycle are intended for illustrative purposes only, and that the herein described pump may be used with differently configured wash cycles and wet portions of the wash cycle than illustrated. It is contemplated, the pump facilitates dispensing fluid at any single time or multiple time during the operation of the dishwasher. Alternatively, pump **192** is configured to facilitate pumping an optimal amount of fluid into wash chamber **106** during a predetermined time interval determined by an electromechanical timer (not shown).

In the exemplary embodiment, pump **192** includes a pump head **240** and a drive **242**. In the exemplary embodiment, pump head **240** has a plurality of rollers (not shown) wherein the number of rollers is dependent on the size of the dishwasher and the operational needs of system **180**. In the exemplary embodiment, drive **242** is integral with pump **192**. In one embodiment, drive **242** is a variable drive. As such, a flow rate of pump **192** is adjustable. In one embodiment, pump **192** is configured to purge the entire system **180** of fluid and/or detergent such that tank **190**, conduit **191**, and dispenser **194** are free of fluid. In an alternative embodiment, pump **192** is reversible and as such may be configured to flush conduit **191** and overcome potential detergent clogs.

In the exemplary embodiment, control board **193** is coupled within door assembly **120** and is in electrical communication with sensor **188** by wire **244**, sensor **220** by wire **222**, and pump **192** by wire **246**. Control board **193** is configured to facilitate determining an optimal amount of deter-

gent dispensed during any wet portion of a wash cycle based on at least one of a water temperature, a water hardness, and a soil level as determined by sensor **188** described above. Control board **193** may also be configured to determine the optimum level of rinse agent required during any wet portion of a wash cycle. In an alternative embodiment, control board may be in electrical communication with only pump **192**. Alternatively, control board **193** may be selected from at least one of an electric device, an electromechanical device, and a mechanical device.

In the exemplary embodiment, control board **193** is configured to facilitate activating pump drive **242**. Control board **193** is configured to activate pump drive **242** to dispense more detergent for dirty dishes and less detergent for cleaner dishes, to dispense more detergent for harder water and less detergent for softer water, and to dispense an optimum amount of detergent based on the water temperature, or any combination of soil level, turbidity, and temperature.

In the exemplary embodiment, dispenser **194** extends at least partially through inner door panel **162** and is coupled to both inner surface **170** and outer surface **172**. Dispenser **194** is coupled in flow communication with conduit **191**. Dispenser **194** includes detergent outlet **184** described above and a grommet **250**. In alternative embodiments, dispenser **194** may include a one-way valve (not shown). In the exemplary embodiment, grommet **250** is fabricated from a rubber material. In alternative embodiments, grommet **250** is fabricated from any other suitable material that enables grommet **250** to function as described therein.

In operation, tank **190** is filled with a known dishwasher detergent. In one embodiment, tank **190** is filled with a plurality of detergents. In one embodiment, the detergent is a commercially available liquid dishwasher detergent or a commercially available liquid rinse agent. The detergent is directed through conduit **191** by pump **192** and out dispenser **194**. When dishwasher racks **130** and **132** are loaded with items to be washed, door assembly **120** is closed, thereby sealing wash chamber **106** for operation of wash cycles. At an appropriate time during the wet portion of the wash cycle, for example, in a pre-wash or wash cycle, control board **193** receives a signal from sensor **188** and activates pump **192**. Detergent is dispensed into dishwasher wash chamber **106** (shown in FIG. **1**) through dispenser **194** wherein the detergent is mixed with water to produce a cleansing fluid for circulation throughout wash chamber **106**.

The above described detergent dispensing system is cost-effective and highly-reliable. The system includes a detergent storage tank and a peristaltic pump permanently mounted within a dishwasher door assembly. The system is configured to determine and dispense an optimal amount of detergent into the dishwasher. Coupling the peristaltic pump and the tank within the door assembly allows for greater detergent storage capacity and minimizes potential leaks. As such, users fill the detergent dispensing system less often, which reduces the amount of time and steps in compared to conventional dishwasher systems. Additionally, dispensing the optimal amount of detergent facilitates improving dishwasher performance and user satisfaction.

While the invention has been described in terms of various specific embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the claims.

What is claimed is:

1. A fluid dispensing system for a dishwasher door assembly comprising an inner door panel and an outer door panel, said system comprising:

a storage tank fixedly coupled within the door assembly between the inner door panel and the outer door panel thereof;

a pump fixedly coupled within the door assembly;

a dispenser extending at least partially through the door assembly;

at least one conduit in flow communication with said storage tank, said pump, and said dispenser; and

a control board in electrical communication said pump.

2. A system in accordance with claim **1** wherein said storage tank is unitary and comprises a first. surface, a second surface, and a plurality of sidewalls extending therebetween, said first surface fixedly coupled to an inner portion of the door assembly.

3. A system in accordance with claim **1** wherein said storage tank is tapered and comprises an inlet formed therein, at least one sensor coupled thereto, and an outlet coupled to said at least one conduit, said at least one sensor in electrical communication with said control board and comprising at least one of a turbidity sensor, a thermal sensor, and a hardness sensor.

4. A system in accordance with claim **1** wherein said pump comprises a peristaltic pump, said peristaltic pump configured to be fixedly coupled to an inner portion of the door assembly.

5. A system in accordance with claim **1** wherein said pump configured to be activated by said control board during a wet portion of a wash cycle, said pump further configured to deliver a set amount of fluid into a dishwasher from said storage tank.

6. A system in accordance with claim **1** wherein said dispenser comprises a grommet coupling said at least one conduit to the door assembly, said grommet comprising at least one of a rubber material, a plastic material, and a metal material.

7. A system in accordance with claim **1** wherein said at least one conduit is flexible and removeably coupled to said dispenser and a tapered portion of said tank, said at least one conduit extends between said tank and said dispenser such that at least a portion of said at least one conduit is positioned within said pump.

8. A dishwasher comprising:

a cabinet comprising a tub having a front opening and a door assembly forming a wash chamber, said door assembly comprising an outer door panel, an inner door panel, and a plurality of sidewalls extending therebetween;

a fluid dispensing system, said fluid dispensing system in flow communication with said wash chamber, said fluid dispensing system comprising:

a tapered storage tank fixedly coupled within said door assembly between said outer door panel and said inner door panel thereof;

a peristaltic pump fixedly coupled within said door assembly;

a dispenser extending at least partially through said inner door panel; and

at least one flexible conduit removably coupled to said door assembly and in flow communication with said storage tank, said peristaltic pump, and said dispenser; and

a control board in electrical communication with said peristaltic pump.

9. A dishwasher in accordance with claim **8** wherein said storage tank is unitary and comprises a first surface, a second surface, and a plurality of sidewalls extending therebetween, said first surface fixedly coupled to said inner door panel, said

storage tank further comprises an inlet formed therein, at least one sensor coupled thereto, and an outlet coupled to said at least one conduit, said at least one sensor in electrical communication with said control board and comprising at least one of a turbidity sensor, a temperature sensor, and a hardness sensor.

10. A dishwasher in accordance with claim **8** wherein said peristaltic pump configured to be fixedly coupled to said inner door panel, said peristaltic pump configured to be activated by said control board during a wet portion of a wash cycle, said peristaltic pump further configured to deliver a set amount of fluid into said wash chamber.

11. A dishwasher in accordance with claim **8** wherein said dispenser comprises a grommet coupling said at least one conduit to said door assembly, said grommet comprising at least one of a rubber material, a plastic material, and a metal material.

12. A dishwasher in accordance with claim **8** wherein said at least one conduit is removably coupled to said dispenser and a tapered portion of said storage tank, said at least one conduit extends between said storage tank and said dispenser such that at least a portion of said at least one conduit is positioned within said peristaltic pump.

13. A dishwasher in accordance with claim **8** wherein said control board is configured to determine an optimal amount of fluid dispensed per wash cycle based on at least one of a water temperature, a water hardness, and a soil level.

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